STUDY OF THE AVIFAUNA OF URBAN AND PERIURBAN AREAS OF CENTRAL ARAVALLI MOUNTAIN RANGES

A

SYNOPSIS

submitted for the Degree of

Doctor of Philosophy (Ph.D.) in

Zoology

to

SAMRAT PRITHVIRAJ CHAUHAN GOVT. COLLEGE, AJMER

MAHARSHI DAYANAND SARASWATI UNIVERSITY

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2016

Under the supervision of
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Submitted By
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APPENDIX- IV-A

FORMAT FOR OUTLINE (SYNOPSIS) OF PROPOSED RESEARCH WORK

1. **Name of Scholar (In English)**: MRIGANKA UPADHYAY

   (हिन्दी में) : मृगांका उपाध्याय

2. **Title of Research Work :** STUDY OF THE AVIFAUNA OF URBAN AND PERIURBAN AREAS OF CENTRAL ARAVALLI MOUNTAIN RANGES

   (हिन्दी में) : अरावली पर्वतमालाओं के नगरीय व परिनगरीय क्षेत्रों के पक्षी प्राणीजात का अध्ययन

3. Location
   a. Institution / Department where the work is to be done.
   b. Geographical area of investigation, if any.
4. Introduction Importance of proposed Investigation, Objective.
5. Review (Work already done on the subject of proposed Research Study).
6. Research Gaps identified in the proposed field of investigation. (Based on the review)
7. Major Hypothesis, if any
8. Research Methodology.
9. List of references cited.

Mriganka Upadhyay 20/05/16

Signature of Candidate with date

Outline Approved

20/5/16

Name and signature of supervisor with date and seal

व्याख्याता
प्राणी शास्त्र विभाग
राजकीय महाविद्यालय, अजमेर

1. **Name of Scholar (In English)**: MRIGANKA UPADHYAY

(हिन्दी में): मृगांका उपाध्याय

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3. **Location**

a) **Institution / Department where the work is to be done:** Department of Zoology, S.P.C. Government College Ajmer, Rajasthan

b) **Geographical area of investigation:**

Profile of Study Area:

Rajasthan (23°30' and 30° 11' North latitude and 69° 29' and 78° 17' East longitude) is the largest province of India with a total area of 3,42,239 square kilometers, which accounts for 10.41% of geographic land area of the country and is situated on the western most limit of the country. Rajasthan is mainly characterized by four major geographical features i.e. the Great Indian Thar Desert, Aravalli Mountain Ranges, Eastern Plains and Southern Malwa and Hadauti Plateau. Aravalli hill ranges diagonally dissect the state and delimit desert to the west.

The central part of the Aravalli mountain ranges is known as Merwara hills the thinnest expansion of the range. The Taragarh (855 meter) is the highest peak with 550 meter average altitudinal level of central Aravalli tract. This range extends with coordinate 26^0 16' N - 75^0 25' E and 26^0 27' N - 74^0 42' E. Study area classified as urban and semi-urban area of central Aravalli mountain ranges.

4. Introduction Importance of proposed Investigation, Objective.

Urbanization is defined as "the process of human settlement that gradually transfers wild-lands, uninhabited by humans into lands containing some degree of temporary or permanent human presence". Urbanization is continuous, and the range of human settlement patterns is often referred to as a gradient of urbanization or the rural-urban gradient (Marzluff *et al.,* 2001). The conversion of native habitats due to urbanization is a primary threat to biodiversity (Wilcove *et al.,* 1998; Brown and Laband, 2006) and contributes to increased rate of extinction (Lawton and May, 1995). Current extinction rates are estimated to be 100 to 1,000 times greater than pre-human settlement rates and 5-20% of the species within the major taxonomic groups have gone extinct in recent times (Chapin III *et al.,* 2000).

By the year 2050 approximately 70% of the world population will live in an urban environment (United Nations, 2011). With the world population expected to reach 9.3 billion by 2050 (United Nations, 2010) the pressure of urbanization on the world's biodiversity is only going to increase (Dramstad, 1996; Clergeau *et al.,* 1998). The impact of urbanization on biodiversity stems from a combination of habitat degradation, habitat loss, loss of ecosystem functions, invasive or exotic species competition or high human disturbance. While this might look like the order of the day and contribute much changing developing nations into developed nations, it does come with its own share of woes and worries. Of various aspects that this necessary evil adversely affects, the major impact is on the ecological balance of the flora and fauna of a region. One group that tends to bear the brunt is the avian family.

Birds are obviously important members of many ecosystems. Birds are highly visible, versatile, adaptable, common animals, and humans have had a relationship with them since the dawn of human life. They are integral parts of food chains and food webs. In a woodland ecosystem for example, some

birds get their food mainly from plants. Others chiefly eat insects or earthworms. Predatory birds feed on small animals other birds and reptiles. Birds and bird eggs, in turn, serve as food for such animals as foxes, raccoons, and snakes. The feeding relationships among all the animals in an ecosystem help prevent any one species from becoming too numerous. Birds play a vital role in keeping this balance of nature. Though human activities have allowed the expansion of a few species, such as the barn swallow and European starling, they have caused population decreases or extinction of many other species. Over a hundred bird species have gone extinct in historical times, although the most dramatic human-caused avian extinctions, eradicating an estimated 750–1800 species, occurred during the human colonization of Melanesian, Polynesian, and Micronesian islands. Many bird populations are declining worldwide, with 1,227 species listed as threatened by BirdLife International and the IUCN in 2009.

The most commonly cited human threat to birds is habitat loss. Other threats include overhunting, accidental mortality due to structural collisions or long-line fishing by catch, pollution (including oil spills and pesticide use), competition and predation from non-native invasive species, and climate change. Governments and conservation groups work to protect birds, either by passing laws that preserve and restore bird habitat or by establishing captive populations for reintroductions. Such projects have produced some successes; one study estimated that conservation efforts saved 16 species of bird that would otherwise have gone extinct between 1994 and 2004, including the California condor and Norfolk parakeet.

This story of dire and desperation is no different from the current situation in India. In India too, the adverse effects of rapid modernization and urbanization on this important link of the ecosystem is evidently visible. There needs to be given a much deserved consideration to this important aspect of ecological

balance to prevent an ultimate crash down which can be detrimental to the very existence of humans and other species.

The presence of birds is a litmus test of the environment. It is for this reason that Birdlife International has its logo "***Save the bird: if birds die, we all die***". As the landscape is modified, natural resources and habitat are replaced by artificial resources and exotic species, and built structures (Boren *et al.,* 1997). The avian species within and without the modified landscape are exposed to novel ecosystem characteristics. These characteristics, which are largely associated with the changes in habitat, preferentially select for certain species (generalists) over others (specialists). Although the study of urban birds has a fairly long history, urban ecosystems have been largely ignored throughout many decades of ecological research (Collins *et al.,* 2000; Miller and Hobbs, 2002).

Since the early 1990s, a different view has emerged, leading to an acceptance of urban settings as ecosystems that are structured and function like other natural ecosystems (McDonnell and Pickett, 1990; Rebele, 1994; Grimm *et al.,* 2000; McKinney, 2002; Miller and Hobbs, 2002). This theoretical view represents an emerging realization that by now, most of the world's land is managed and dominated by humans (approximately 50% of the human population lives in cities). Wild-lands are continuously converted to agricultural fields and urban areas. Consequently, urban environments can no longer be viewed as lost habitat for wildlife, but rather as new habitat that, with proper management, has the potential to support diverse bird communities. During the last decade urban ecosystems have therefore become ecological challenges in conservation, restoration, and reconciliation ecology (Miller and Hobbs, 2002; Rosenzweig, 2003). Designing sustainable urban ecosystems that support species-rich bird communities also includes maintaining key ecosystem services, such as clean air and water, waste decomposition, and pest control.

The aim of the proposed study is to consider the above fact and consider our urban setting as a separate ecosystem which if managed properly has the potential to support diverse communities and formulate a new co-existence approach for humans and birds in this fast moving age of rapid urbanization keeping in mind the environmental peculiarities as existing in the diverse flora of India. As Ajmer is a strong contender in the list of future smart cities the present work will be a stalwart establishing a new coexisting approach between two key species.

OBJECTIVES:

The present study has been undertaken with the following objective:

1) To Document the occurrence of avifaunal components according to microhabitats with special reference to urban and peri-urban areas.
2) To evaluate the habitat utilization and their key features influencing the avifaunal components.
3) To find out the coexisting sustainable approach for conservation strategy planning of avifaunal components.
4) To recommend some action plan for the avifaunal diversity conservation.

5. Review (Work already done on the subject of proposed Research Study).

The world's human population growth and its associated urban expansion resulted in an extensive modification of the surroundings proximal to the natural environment of cities and towns (Foley *et al.,* 2005). All over the world, nearly more than 50% of humans live in urban areas and this proportion is growing rapidly, is expected to grow to more than 66% by 2025 (McDonald, 2008), which will lead to irreversible effects on urban surroundings and natural resources.

The relationship between humans and wildlife in urban areas is complex; humans and wildlife thus have mutual benefits and disadvantages for both components as they share limited space in urban and peri-urban areas. In recent times a significant challenge for researchers is to understand how bird communities may change with urbanization. This evaluation is becoming more important and complex as each urban area is developing in a different manner. Thus, the impact assessment is more precise at local level instead of general or global studies. There is an increasing interest in bird communities in urban and suburban habitats as they are amongst the most visible components of urban biodiversity (Caula *et al.,* 2014).

The habitat features and characteristics are considered as critical key factors for avian fauna. Habitat structures with respect to avian communities essentially encompass the configuration of vegetation. The structure can thus act as an ultimate factor in habitat selection by its association with critical sources like food, nesting sites or cover from predators (Rotenberry and Weins, 1980). The structural components of habitat operate over a functional gradient of time and space, a phenomenon often referred to as landscape behaviour. And the response of bird communities to such landscape behaviour is an important correlate in habitat selection and spatial distribution of birds.

Among all wildlife, birds are one of the most common wildlife in urban areas such as neighborhoods and cities, and many bird populations have been declining as a result of landscape changes due to urban expansion (Austin and Smith, 1972; Coppedge *et al.,* 2001; Evans *et al.,* 2009; Strohbach *et al.,* 2009). At the local level, these major changes include high rates of land conversion into urban uses and increasing human pressure on biodiversity due to rapid population growth. Due to the important role that birds play in maintaining ecosystems and supporting biodiversity, many seek their protection to manage biological threats and efficiently protect the environment (Stevenson and Fanshawe, 2002).

Birds play vital roles in an ecosystem as they control pest populations through predation and scavenging, pollinate and disperse seeds, leading to increase in plant coverage, and are also recognized as biological indicators of ecosystem health (Gregory *et al.,* 2003). Of the 9026 species of birds distributed across the world, India harbors about 1300 species, belonging to 88 families (Manakadan and Pittie 2001; Rasmussen and Anderton 2005).

By the year 2050, it is estimated that the majority of the global population will live in urban areas (Loss *et al.,* 2009). Threats to biodiversity are particularly inherent to such rapid urbanization, which raises concern over the future of the already reduced diversity in settings surrounding urban neighborhoods (Evans *et al.,* 2011). In many developing countries, a large number of wildlife survives outside protected areas on farmlands, pasturelands, and in urban areas (Bolwig *et al.,* 2006; Hitchmough and Dunnett, 2004).

Anthropogenic actions have been responsible for the loss of habitat and the decline in individual populations of many species in the past few decades (Butchart *et al.,* 2010), and global climate change is predicted to cause species extinction and distributional shifts in the next few decades (Midgley *et al.,* 2001, Erasmus *et al.,* 2002, Thomas *et al.,* 2004).

Urban planners need better information about the factors affecting the distribution of species and structure of communities in order to create or maintain biodiversity in urban areas. Conservation or restoration efforts related to urban wildlife focus on limiting artificial habitat, developing citizen participation in wildlife conservation, improving the quality of life of urban dwellers, and educating them about ecological concepts (Gilbert, 1989; Niemelä, 1999).

Human activities have produced similar ecological structures in urban areas even in different bio-geographical regions. The response of birds to these environmental changes could lead to the dominance of bird communities by a few very abundant species (Bezzel, 1985). Thus, urbanization causes uniform

bird communities in urban areas (Jokimäki *et al.,* 1996) and urban areas can be categorized as a specialized ecosystem with its own characteristics and species (Bezzel, 1985).

Nature doesn't stop at the doorstep of a town or city. Ecosystems exist, the world over, though they vary in their health, diversity, and other properties. Therefore, urban environments do have a capacity to serve the 'needs' of species other than humans, and in this case an urban green space's ability to meet the ecological needs of bird species is assessed. According to past research, in many urban environments particularly those with a low abundance of trees and a lack of structural diversity bird species that can be found are usually generalists ones. Therefore, there is scope to use bird species diversity in an urban environment to indicate its overall green space structural diversity (Sanesi *et al.,* 2009; Lerman *et al.,* 2011; Santruckova, 2016).

6. Research Gaps identified in the proposed field of investigation. (Based on the review)

In the present scenario as urbanization and development is inevitable and planning is in process for the coming few decades, if proper strategies are implemented that can be a supportive measure for the coexistence approach, it will definitely be beneficial for both the components i.e. urban development and wildlife conservation. After reviewing, it was observed that there was very little or negligible work done on urban avifauna in central Aravalli foothills. The present proposed investigation is an approach to fulfill these research gaps; and may also be utilized as suggestions to policy makers with the consideration of coexistence of Human-wildlife.

7. Major Hypothesis, if any

Urbanization is extending day by day and it affects the natural resources including the biotic components. This great pressure on biotic components is more severe in urban and peri-urban areas. Thus, there is an urgent need to find out a coexisting sustainable approach for the conservation of various faunal components.

8. Research Methodology.

Present investigation will comprise of proper scientific methodology and use recent modern tools for achieving the goals of proposed investigation.

Several large scale random surveys will be carried out during the study for documentation and assessment of the avian faunal diversity of urban and peri-urban areas of central Aravalli foothills. Various scientific survey methods i.e. ad-hoc, transect, visual encounter, point count, call count etc. protocols shall be used to document the occurrence and abundance of the avian diversity. Data outcome about the population abundance will be evaluated with the help of various biodiversity indices such as Assessment indices (Shannon-Wehnior, Simpson etc.); Similarity-Dissimilarity indices (Jaccard, Sorenson etc.) and Association indices. Potential sites will be identified and marked as biodiversity zones or biding areas, these zones could be developed which would also provide livelihood to the local inhabitants.

Expected duration of proposed Research work

The proposed research work will be completed in two year. The year wise details are as follow:

During I year:

- General surveys shall be conducted to study all sites for avifauna of Urban and Peri-urban areas of central Aravalli mountain ranges.
- Collection of literature particularly research methodology based.
- **During II year**:
- Analysis of the collected data in comparable form along with the statistical tests and their analysis.
- Graphical and tabular presentation of data.
- Compilation of the work and preparation of the thesis.
- Preparation of full length paper related to findings for national and international publication and for presentation at compatible platform.

CHAPTER WISE DETAIL OF PROPOSED RESEARCH

The chapters of the thesis are proposed as follows:

1 **Introduction:** This chapter will comprise of the basic introduction about the proposed investigation and objective work under taken.

2 **Review of literature:** This chapter will include the recent scientific studies that have been done in the concerned field.

3 **Material and Methods:** This includes the various tools and techniques that we will utilize for our proposed research work and details about the statistical tools utilized.

4 **Result and Discussion:** The outcome of the proposed research work will be tabulated and summarized with the help of various graphical and

pictorial representations and results will be discussed taking into account recent available scientific literature.

5 **Conclusion:** The outcome of research will be concluded under the headings of objectives. Suggestion to the policy makers would be recommended.

6 **Summary:** A generalized summary of the research work undertaken will be documented.

Bibliography: All literature cited under the study will be enlisted in proper order following International norms.

Facilities available for the research work:

All the necessary research facilities required for the proposed study are available at the Post Graduate Department of Zoology, SPC Government College Ajmer.

Signature
Head Department of Zoology,
SPC Govt. College, Ajmer

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20/5/16

Outline Approved

Name and signature of supervisor with date and seal

Mriganka Upadhyay
20/05/16

Signature of Candidate with date

Certificate by Supervisor

Certified that:

1 I am willing to guide the research of Mrs. **MRIGANKA UPADHYAY** on the above subject if he registered for Ph.D.

2 To the best of my knowledge, the subject selected has not been studied and is not being studied so far in any University.

3 The subject is of sufficient scope to keep the candidate engaged for two year.

4 The subject will lead to a valuable contribution. I have seen and approved the outline and bibliography, etc. submitted by the candidate.

5 Necessary facilities are available in the department for the above research work, (certificate from principal/head university department with regards to facilities available is enclosed.)

6 I have.....Research candidate registered under my supervision and the serial number of this candidate whose application being forwarded for registration is.....

7 The candidate is not in a close relation (the term of close relation is defined in the examination ordinance of the University).

20/5/16

Signature of the supervisor with date

CERTIFICATE

राजकीय महाविद्यालय, अजमेर

Certified that the available facilities will be extended to Mrs. **Mriganka Upadhyay** for research work if he registered for Ph.D.

उपाचार्य
राजकीय महाविद्यालय, अजमेर

Signature of the Principal/ Director of the Institution with date

Signature of the Head Department with date